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The low temperature behaviour of Al-3d dilute alloys has been investigated recently by several authors. In contradiction to the static susceptibility measurements which did not show any temperature dependence, the impurity resistance exhibits an anomaly. NMR investigations of these alloys are therefore of particular interest.

Launois and Alloul [1] found recently an extra line in the NMR spectra of AlMn alloys which was attributed by the authors to the resonance of Al nuclei taking place on one of the nearest shells surrounding the Mn atoms. It was assumed that the frequency dependence of the relative shift of the extra line from the central resonance reflexes a magnetic behaviour of the alloys.

We belive the observed extra line has a spurious origin, namely it is caused by Al_2O_3 impurity. The fine powder commonly used in NMR investigations of good conductors has a large specific surface which favours oxidation. As it is well known metallic aluminium oxidizes strongly and is always covered by a thin oxide layer preventing further oxidation. Inhomogeneities of the surface caused by impurities enhances the oxide layer [2], this explains the observed impurity-concentration dependence.

The relative shifts, quadrupole coupling constants and linewidths of the "satellite" reported by [1] and of Al_2O_3 [3] are compared in table 1. We beleive the agreement to be convincing.

To demonstrate the oxidization effect we measured the ^{27}Al NMR signal in an Al 0.4 at% Si alloy. The alloy was made of an aluminium ingot of 99.999% purity. The sample was filed /average diateter of grains was approximately 30 μ/, the iron particles were removed in a strong inhomogeneous magnetic field. The powder was annealed for 1 hour at 550 ^{o}C in vacuum to avoid the dislocation pinning by the impurities [4] and to homogenize the alloy. No darkening of the powder was observed after annealing.

Figure 1. shows a characteristic spectrum obtained at room temperature in a 5.5 kOe external field. The arrow indicates the position of the line reported by [1] in AlMn at room temperature. We obtained qualitatively the same spectra before annealing.

The density of the oxide layer can be estimated from the intensity of the extra line to be of the order of 10 $\mu g/cm^2$. In obtaining this value it was taken into account that only the $1/2 \rightarrow -1/2$ transition can be observed in the Al_2O_3 because of quadrupole splitting. It is a rather high but still reasonable value when compared with published data of AlMg alloys [5] .

Further investigations of AlMn powder and foils /the latter having a small specific surface/ are in progress.

References

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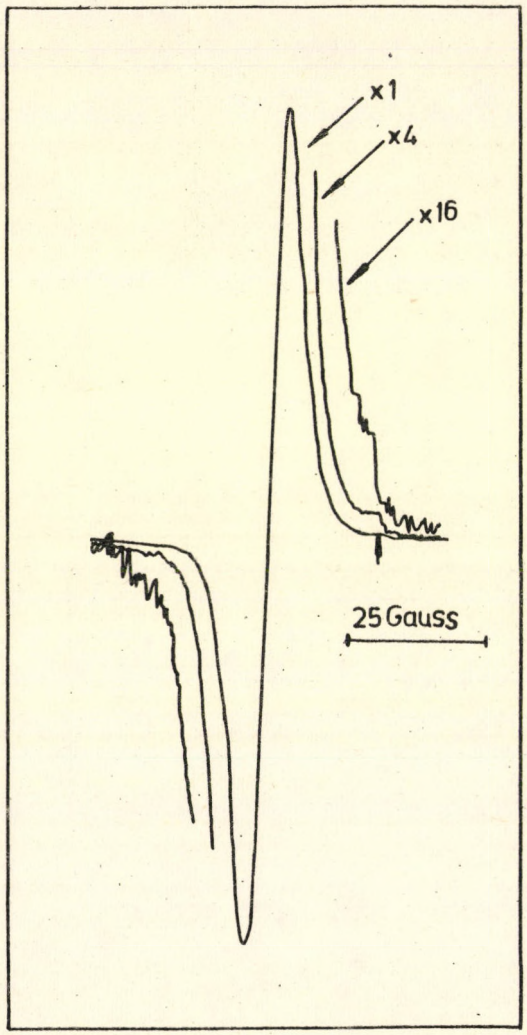

Fig. 1.

^{27}Al NMR signal in Al 0.4 at% Si powder at three different gains. The arrow indicates the position of the line reported by [1]

Table I.

NMR parameters of satellite reported by [1] and those of Al_2O_3 .

	$\Delta K/K$ /%/	$\frac{e^2 q Q}{h}$ /MHz/	H_{p-p}/G/
satellite [1]	-109 ± 7	2.4	8
Al_2O_3	-100	2.33	8

$\Delta K/K$: shift relative to Knight shift;

$\frac{e^2 q Q}{h}$: quadrupole coupling constant;

H_{p-p} : peak-to-peak linewidth of derivative signal